2024 PORTUGAL RENEWABLE ENERGY SUMMIT

Critical Success Factors for the Energy Transition

Manuel Costeira da Rocha
Director Technology Strategy, Smartenergy

APREN
Lisbon, 4 November 2024

APREN Associação de Energias Renováveis

Smartenergy at a glance

We invest sustainably by promoting renewable projects

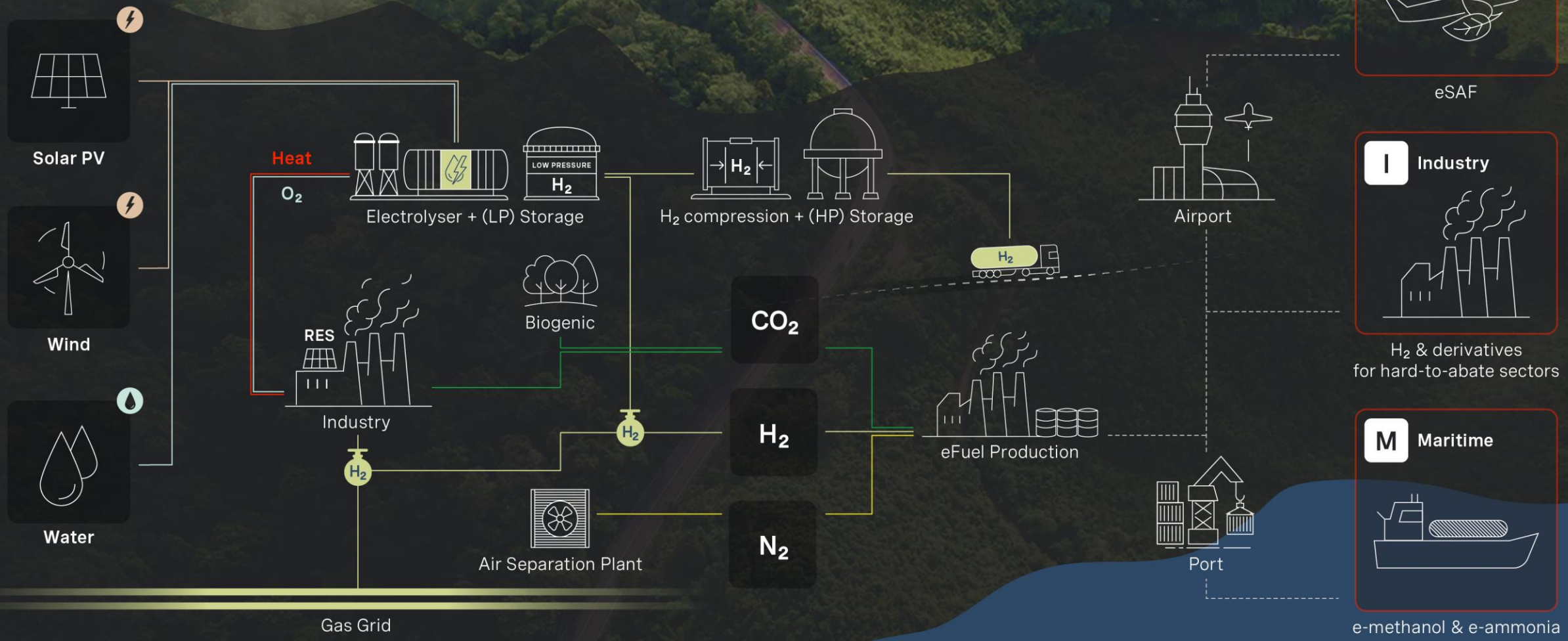
12
Offices worldwide

>400
Employees

>7 GW
Built globally

~12 GW
Project Pipeline

We cover the entire value chain from renewables to eSAF, eFuels for shipping and H2 for hard-to-abate industries



Critical Success Factors for the Energy Transition!

Agenda

01 Insights from World Energy Outlook 2024

02 What can we learn from the electrical vehicles deployment in China?

03 Will the green hydrogen market follow the same path?

04 The need of strong institutions for a successful energy transition in Europe

05 Conclusions

01

Insights from World Energy Outlook 2024

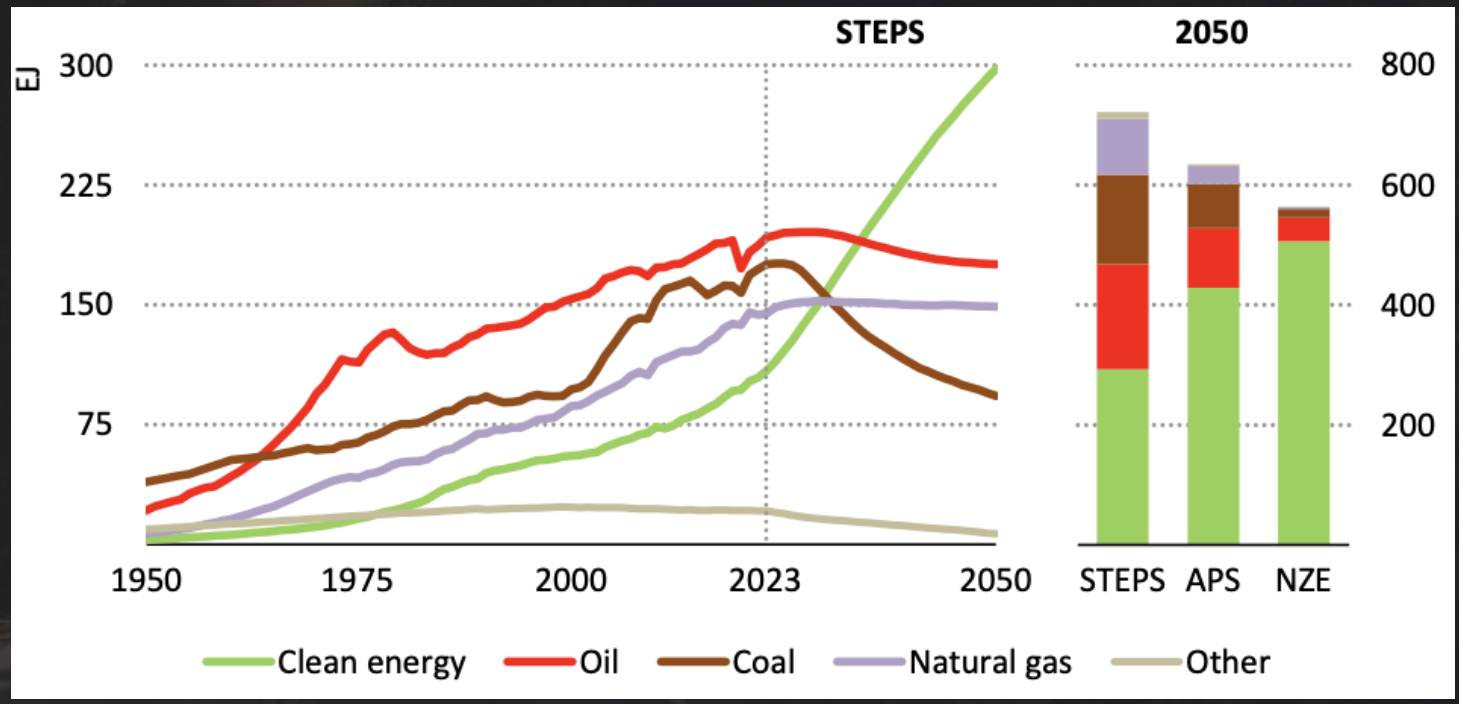
Some insights from World Energy Outlook 2024

Clean energy poised for huge growth

STEPS, a scenario based on current policy settings, sees the following trends:

- Clean energy poised for huge growth.
- Coal, oil and natural gas each reach a peak by 2030 and then start to decline.

Global energy mix by scenario to 2050



Notes: EJ = exajoules; STEPS = Stated Policies Scenario; APS = Announced Pledges Scenario; NZE = Net Zero Emissions by 2050 Scenario. Oil, coal and natural gas refer to unabated uses as well as non-energy use. Clean energy includes renewables, modern bioenergy, nuclear, abated fossil fuels, low-emissions hydrogen and hydrogen-based fuels. Other includes traditional use of biomass and non-renewable waste.

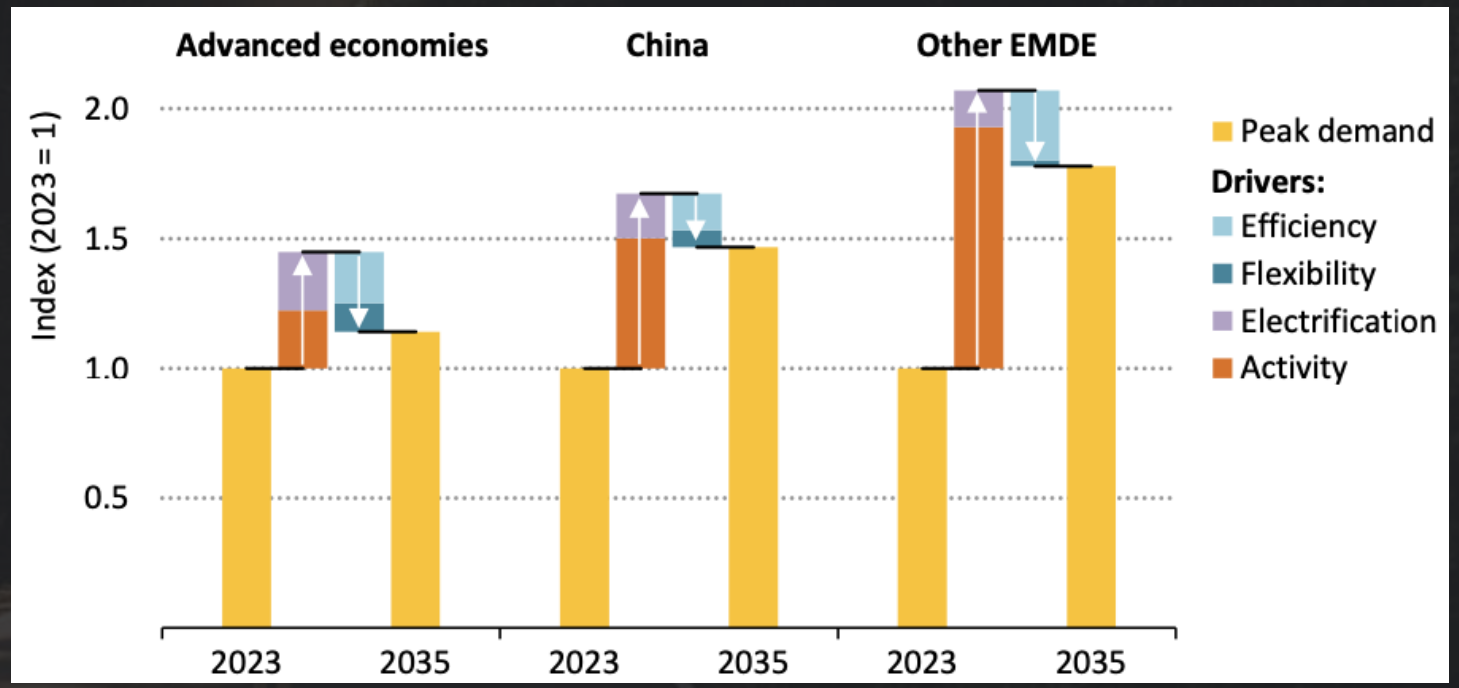
 Source: World Energy Outlook 2024, IEA

Some insights from World Energy Outlook 2024

Key drivers of peak demand growth

Higher activity and end-use electrification are key drivers of peak demand growth, but efficiency gains and nascent demand-side flexibility mitigate some of the increase.

Peak electricity demand by driver and region in the STEPS, 2023-2035



Notes: Other EMDE = emerging market and developing economies other than China. Peak demand is the average level of demand for the 100 hours of the year with the highest demand.

 Source: World Energy Outlook 2024, IEA

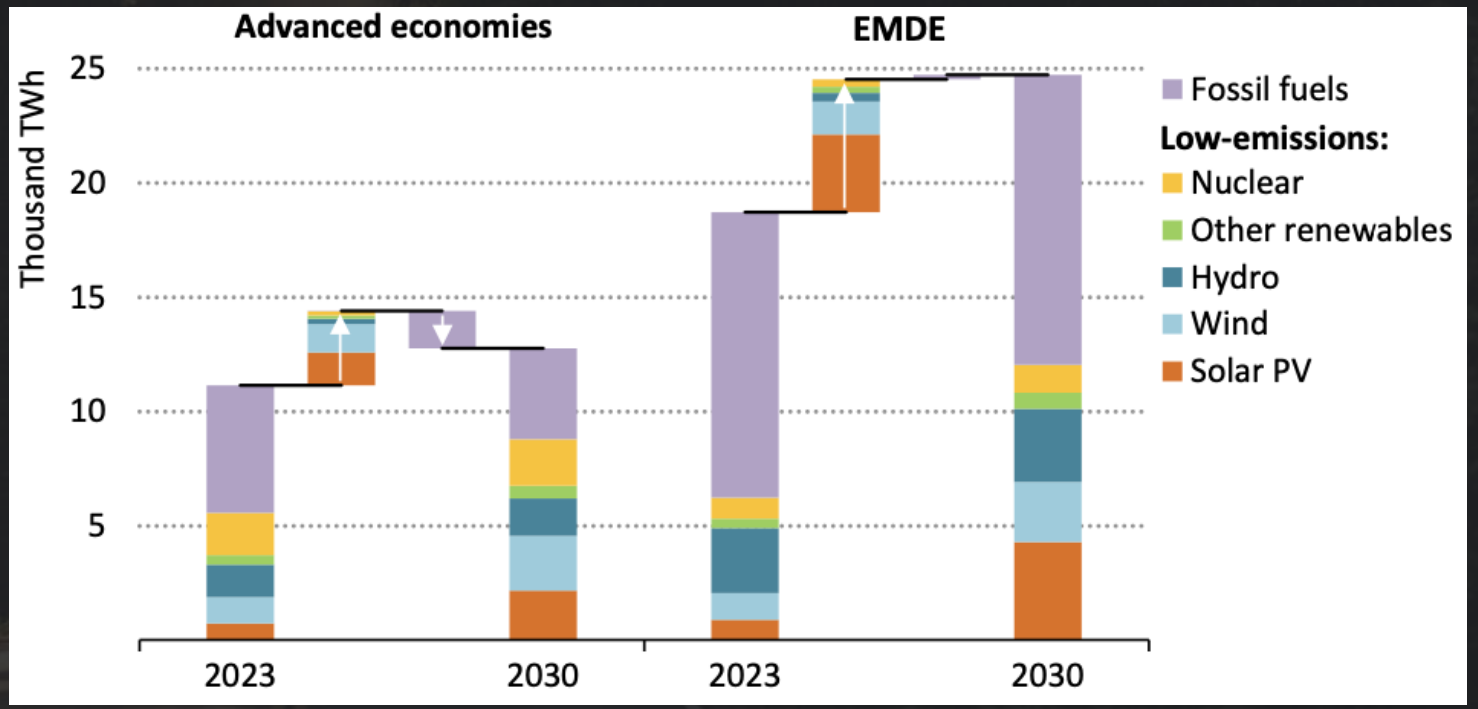
Some insights from World Energy Outlook 2024

Low-emissions sources outpace electricity demand growth

Low-emissions sources outpace electricity demand growth in advanced economies to 2030.

Reducing fossil fuel use by 30%, and in share terms matches demand growth in emerging market and developing economies.

Electricity generation by source in advanced economies and EMDE in the STEPS, 2023-2030



Notes: Other EMDE = emerging market and developing economies other than China. Peak demand is the average level of demand for the 100 hours of the year with the highest demand.

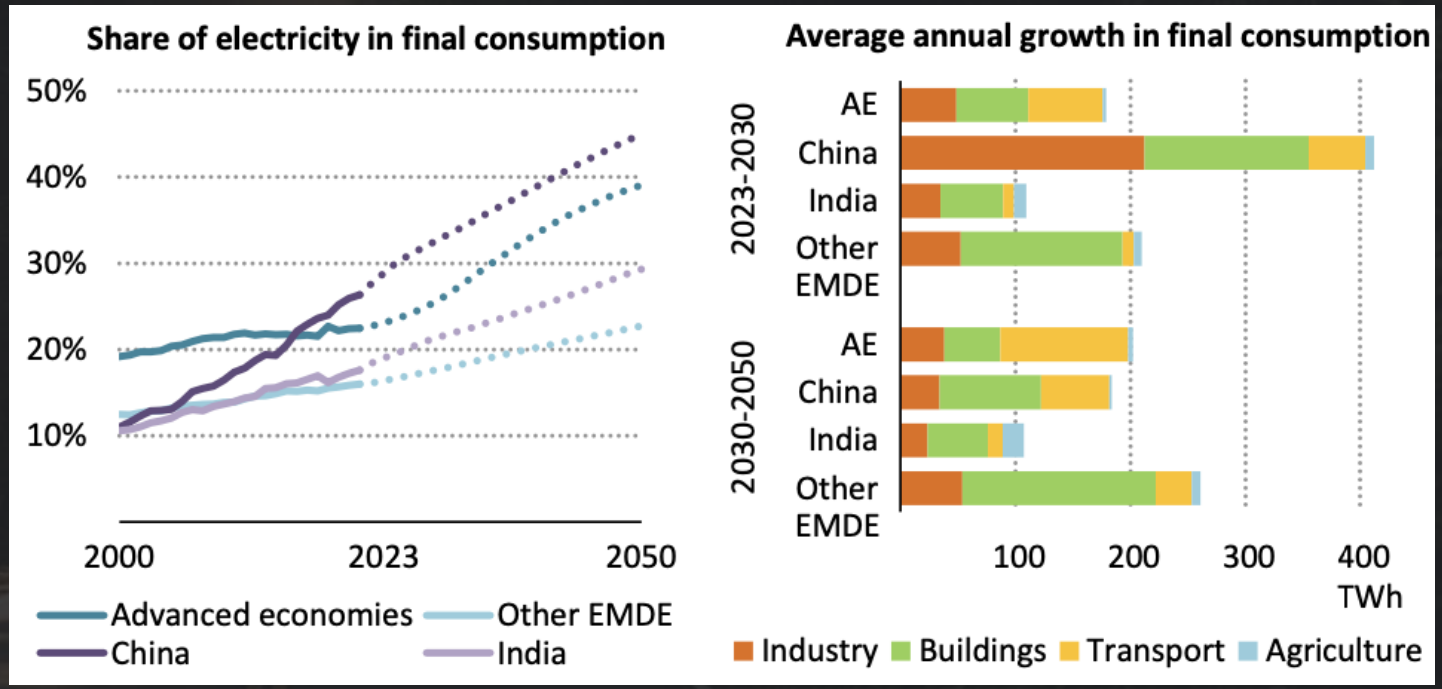
 Source: World Energy Outlook 2024, IEA

Some insights from World Energy Outlook 2024

Market growth trends

Emerging market and developing economies, especially China, dominate the growth story in all sectors, while advanced economies see demand increase as transport electrifies.

Electricity in total final consumption and demand growth in the STEPS to 2050



Notes: Other EMDE = emerging market and developing economies other than China. Peak demand is the average level of demand for the 100 hours of the year with the highest demand.

 Source: World Energy Outlook 2024, IEA

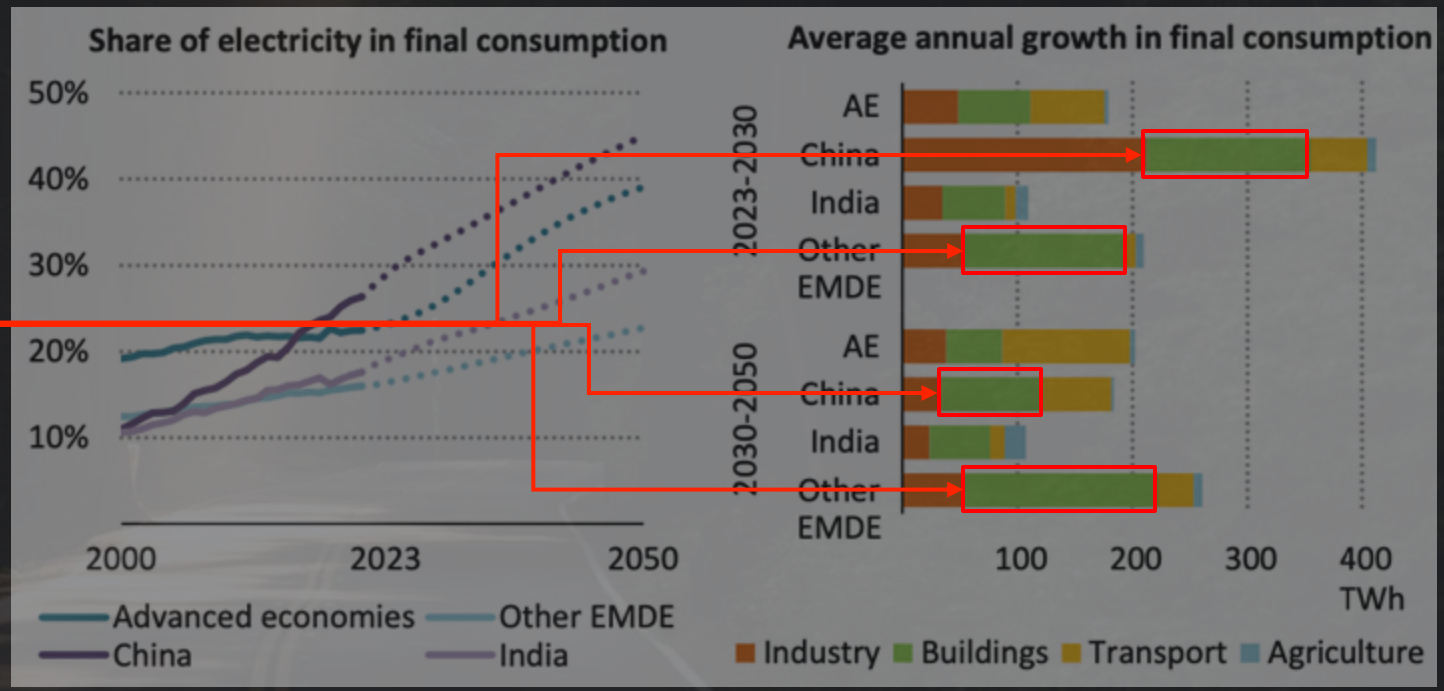
Some insights from World Energy Outlook 2024

Market growth trends

Emerging market and developing economies, especially China, dominate the growth story in all sectors, while advanced economies see demand increase as transport electrifies.

Buildings will be responsible for relevant average annual growth in final consumption in China and emerging markets, beyond 2030.

Electricity in total final consumption and demand growth in the STEPS to 2050



Notes: Other EMDE = emerging market and developing economies other than China. Peak demand is the average level of demand for the 100 hours of the year with the highest demand.

”

The difficulty with global warming: to attack it. You need to attack at least 10 or 15 items. One item will give us 3%, another item will give us 4%, another 7%.

The biggest item is the hardest.
It's domestic consumption for heating and cooling, because people want air conditioning. This is a big problem, because **there are eight billion people**.

Vaclav Smil
Expresso, Oct 2024

Some insights from World Energy Outlook 2024

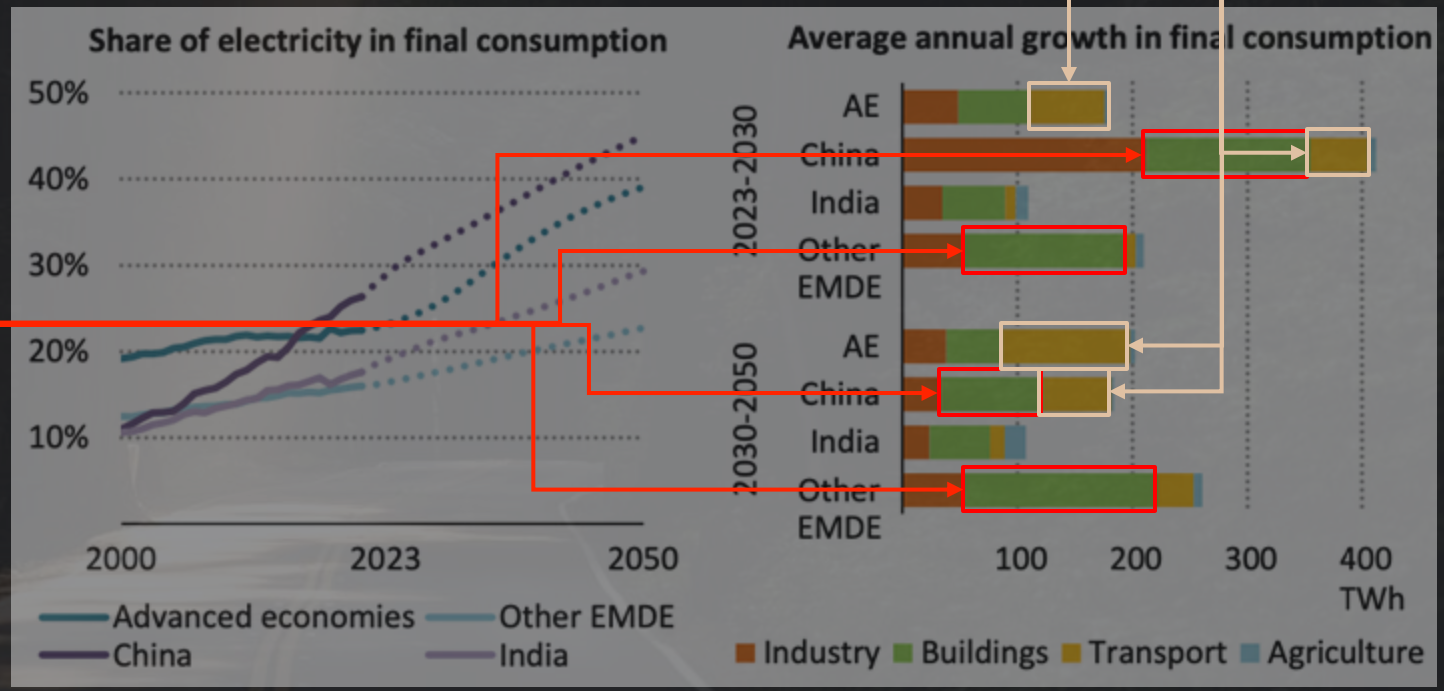
Market growth trends

Emerging market and developing economies, especially China, dominate the growth story in all sectors, while advanced economies see demand increase as transport electrifies.

Buildings will be responsible for relevant average annual growth in final consumption in China and emerging markets, beyond 2030.

Transport electrification will have a huge impact on average annual growth in final consumption in China and Advanced Economies until 2050.

Electricity in total final consumption and demand growth in the STEPS to 2050



Notes: Other EMDE = emerging market and developing economies other than China. Peak demand is the average level of demand for the 100 hours of the year with the highest demand.

02

What can we learn from the electrical vehicles deployment in China?

What can we learn from the electrical vehicles deployment in China?

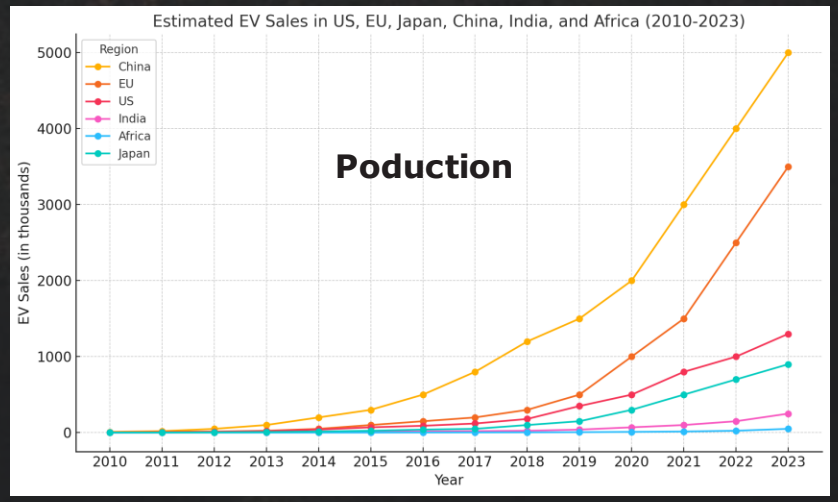
Electrical vehicle market

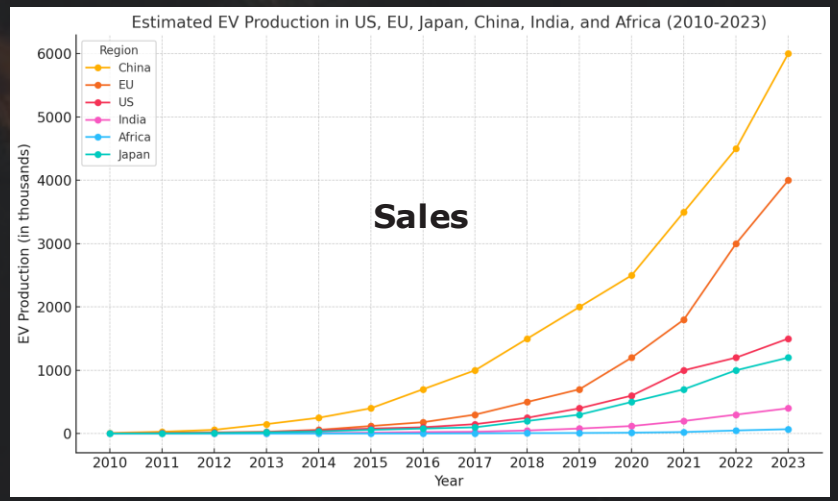
China, followed by Europe, is leading the deployment of the electrical vehicle market, with USA and Japan is losing pace since 2019.

Food for thought:

Why is China leading, and not Japan, or USA, or even Europe? Why now?

Electric vehicle market 2010-2023

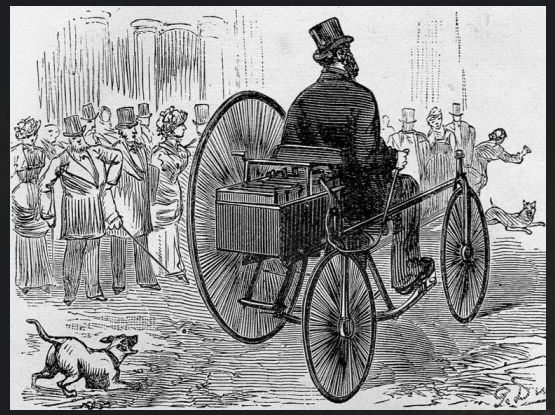




What can we learn from the electrical vehicles deployment in China?

Electrical vehicles historically

Many have tried to create a mass market for electric vehicles, but all failed until some few years ago.

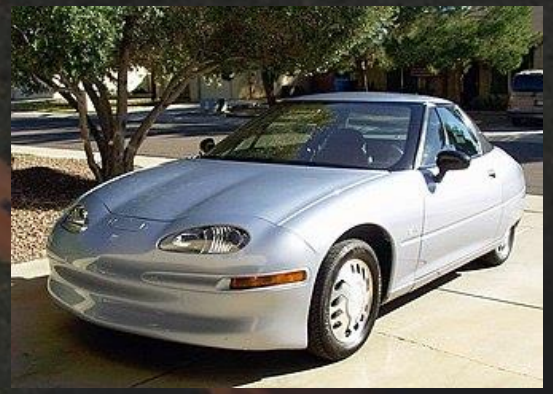


1881

Gustave Trouvé's tricycle, world's first electric car.

1920

Detroit Electric Model 82.



1999

The General Motors EV1 had a range of 260 km (160 miles) with NiMH batteries in 1999.

2009

Mitsubishi i-MiEV.

 Source: Wikipedia; Desk Research

What can we learn from the electrical vehicles deployment in China?

The electrical market in China

EV have been a priority for China for more than 20 years, with direct government support for the industry since 2009, benefiting from Mr. Wang Gangs visionary work.

2001
EV technology introduced as a priority in China's Five-Year Plan.

2007
Wan Gang becomes Minister of Science and Technology, championing EVs.

2009
Government begins offering financial subsidies for EV production.

Financial Incentives

Over $29 billion in subsidies and tax breaks from 2009 to 2022.

Procurement Contracts

Government contracts for public transportation EVs supported early growth.

License Plate Policies

Easier access to license plates for EV buyers in major cities.

Notes: TWh = terawatt-hours; AE = advanced economies; Other EMDE = emerging market and developing economies other than China and India.

 Source: "Climate Capitalism", Akshat Rathi; Desk Research

What can we learn from the electrical vehicles deployment in China?

The electrical market in China

China has become a world leader in electric vehicle (EV) production and sales. In 2022, China sold 6.8 million EVs, dwarfing the US market of 800,000.

Market Dominance

1. **Global Leader**
   China accounts for over 50% of electric cars worldwide.
2. **Export Power**
   China provided 35% of global EV exports in 2022.
3. **Domestic Growth**
   New EV sales in China increased by 82% in 2022.

What can we learn from the electrical vehicles deployment in China?

The electrical market in China

Encouraging Operational Solutions

Government Support

China implemented subsidies for hybrid and electric vehicles in 10 cities.

Taxi Collaboration

EV producers worked with taxi companies to improve battery technologies and charging scheduling.

Grid Management

New charging schedules helped flatten city power grid consumption curves.

Focusing on Core Technology

Battery Innovation

Chinese automakers recognized batteries as 30-40% of EV manufacturing costs.

Raw Material Advantage

China produced 70% of global rare earth materials in 2022.

Supply Chain Control

Chinese companies gained negotiation power with suppliers beyond batteries.

Collaborative Ecosystems

Collaborative Ecosystem

BYD and Geely collaborated with global automakers and tech companies.

Acquisitions

Chinese companies acquired international automotive and technology firms.

Joint Ventures

Partnerships formed to develop intelligent EVs and software.

03

Will the green hydrogen market follow the same path?

Will the green hydrogen market follow the same path?

Green Hydrogen Projects 2023

Projects completed in 2023 with capacity above 0.9 MW reached an installed total capacity of 1621 MW (31 projects).

North America
124 MW

Europe
408 MW

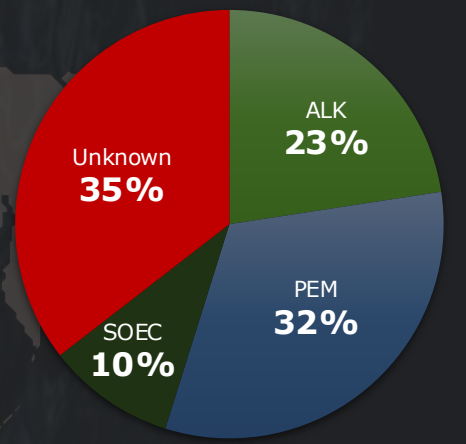
Asia
755 MW

Africa
169 MW

South America
101 MW

Oceania
64 MW

Project's chosen Technology



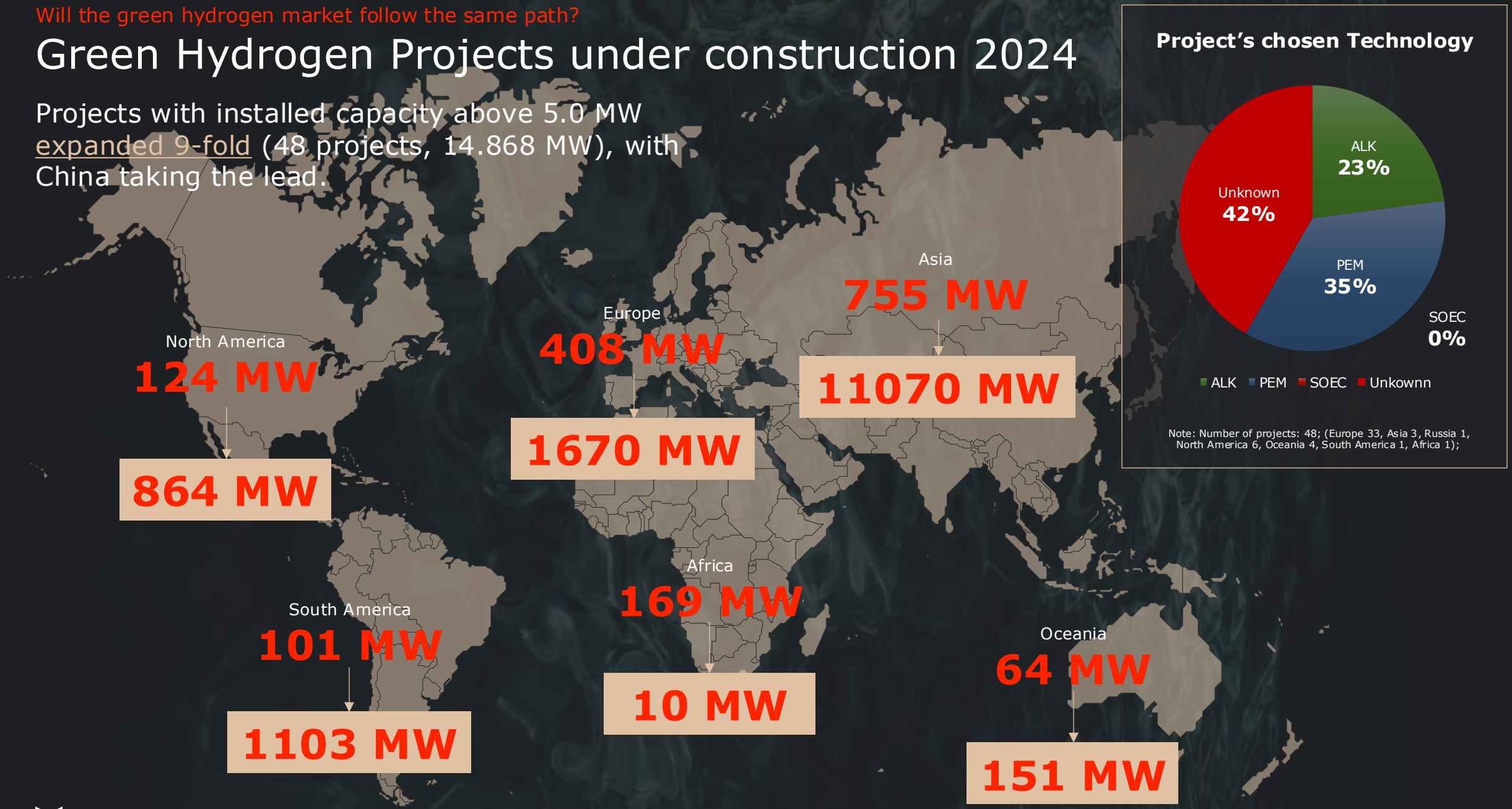
Note: Number of projects: 31; (Europe 17, Asia 7, Russia 1, North America 4, Oceania 1, South America 1)

 Source: Global Data; Desk Research

Will the green hydrogen market follow the same path?

Green Hydrogen Projects under construction 2024

Projects with installed capacity above 5.0 MW expanded 9-fold (48 projects, 14.868 MW), with China taking the lead.



 Source: Global Data; Desk Research

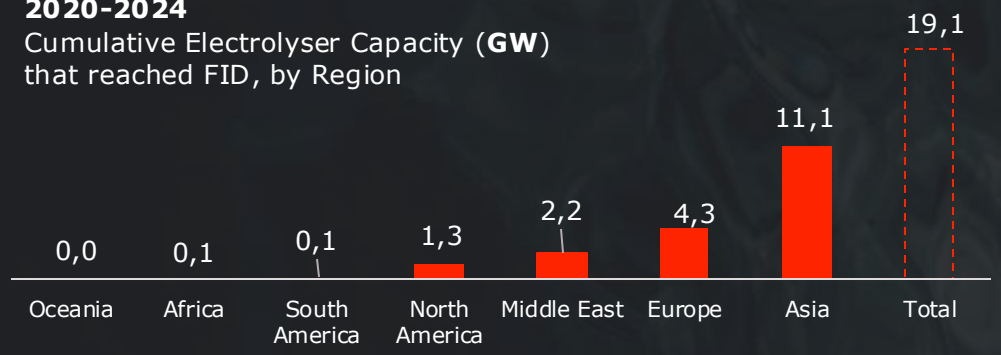
Will the green hydrogen market follow the same path?

Green Hydrogen Projects reaching FID

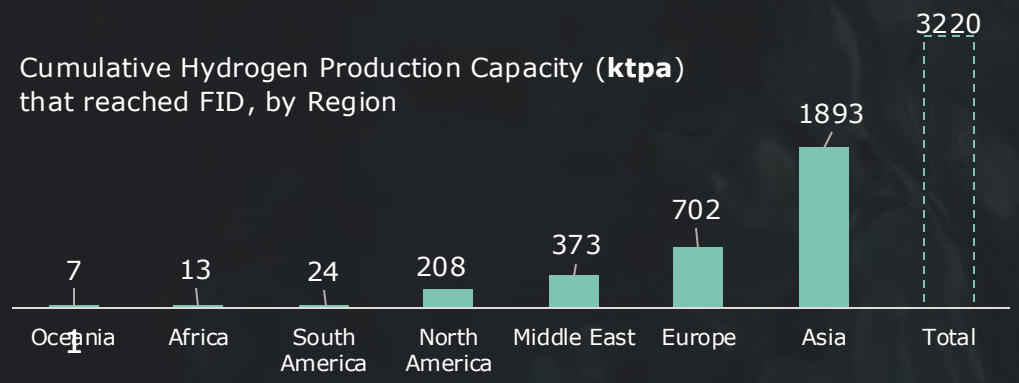
Projects that reached FID between 2020 and 2024 have a Cumulative Electrolyser Capacity of ca 20 GW, out of which 60% in Asia.

IEA 50

2020-2024
Cumulative Electrolyser Capacity (**GW**) that reached FID, by Region

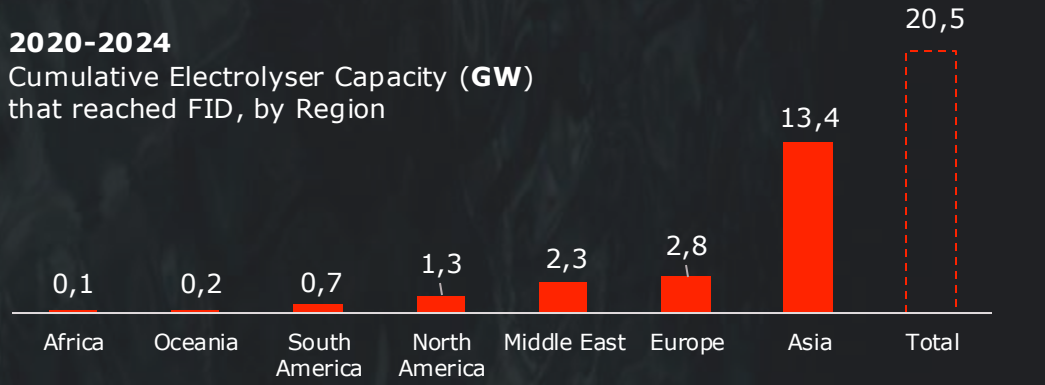


Cumulative Hydrogen Production Capacity (**ktpa**) that reached FID, by Region

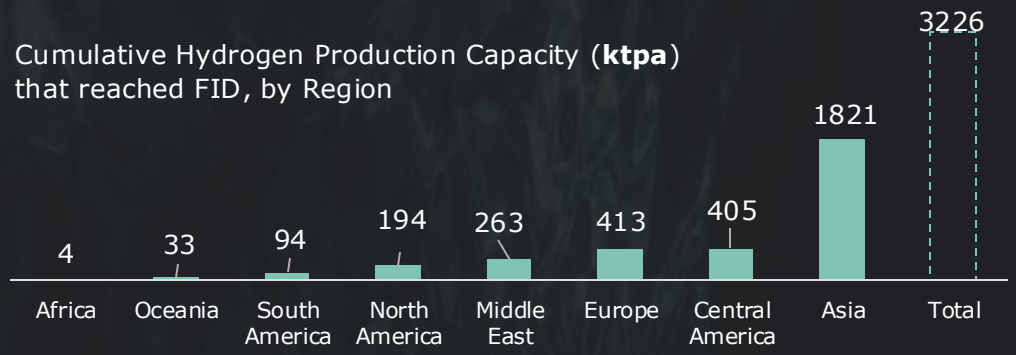


GlobalData.

2020-2024
Cumulative Electrolyser Capacity (**GW**) that reached FID, by Region



Cumulative Hydrogen Production Capacity (**ktpa**) that reached FID, by Region



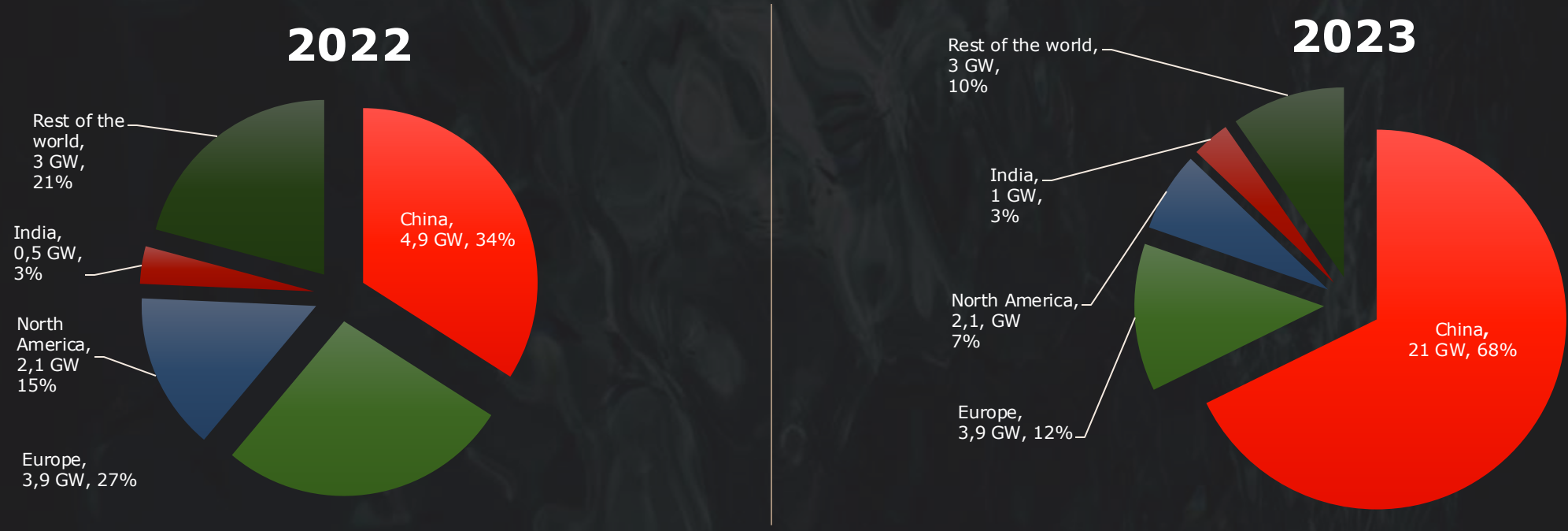
 Source: IEA; Global Data; Desk Research

Will the green hydrogen market follow the same path?

Electrolyser manufacturing capacity

The electrolyser manufacturing capacity in China increased from 4.9 GW to 21 GW in 2023, reaching a market share of 68%.

Electrolyser manufacturing capacity 2022 – 2023 (GW/year, %)



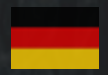
 Source: IEA; Global Data; Desk Research

Will the green hydrogen market follow the same path?

Chinas expansion plans

China is quickly arriving to EU with expansion plans already publicly announced: 10.5 GW/pa of electrolyser manufacturing capacity, with Spain as a leading investment destination.

Chinese corporations' presence announced for EU

Companies	R&D Centers	Electrolysers Manufacturing Facilities	Green Hydrogen Production Plant	Agreements	Countries
Sungrow	H2 R&D in Germany				
Hygreen Energy	R&D in Spain ALK 10MW testing platform.	Yes; 5GW p/a	1.12 GW	Coxabengoa Voltan Kemte	
Trina Solar		Yes (tbd)	160MW		
GuoFuhee		Yes; 1GW p/a, 2nd year		160MW green hydrogen plant	
Envision		Yes; 5GW p/a		(MoU) Spain’s Gov, to spend $1bn	

 Source: BloombergNEF, Hydrogen Insights, IEA, Smartenergy; Desk Research

Will the green hydrogen market follow the same path?

Decarbonization of hard-to-abate sectors

Europe needs to speed up the pace on the green hydrogen route for the decarbonization of hard-to abate-sectors.

Food for thought:
We need strong institutions for a successful energy transition in Europe.

"Hydrogen production and imports will need to play a specific role in decarbonising hard-to-abate sectors, such as transport, chemicals and metal industries, as well as to enable industry to source hydrogen from renewable-rich regions.

Mario Draghi,
The future of Europe competitiveness, Sept 2024

04

The need of strong institutions for a successful energy transition in Europe

The need of strong institutions for a successful energy transition in Europe

What will be the future foundation?

FINANCIAL TIMES

Subscribe Sign In

HOME WORLD US COMPANIES TECH MARKETS CLIMATE OPINION LEX WORK & CAREERS LIFE & ARTS HTSI

Nobel prizes + Add to myFT

Trio of economists wins Nobel Prize for work on wealth of nations

Daron Acemoglu, Simon Johnson and James Robinson commended for advancing understanding of inequality

Save

From left: Daron Acemoglu, Simon Johnson and James Robinson. The Nobel committee said the trio's insights showed that democracies were 'on average . . . better for promoting growth' © AP

Delphine Strauss in London OCTOBER 14 2024

348

The need of strong institutions for a successful energy transition in Europe

What will be the future foundation?

Acemoglu's and Robison research emphasises the relationship between technological innovation and economic growth. They discuss how policy decisions can shape the direction of technological development.

Policy Decisions
Shape the direction of technological development

Green Innovation Incentives
Subsidies, carbon pricing, R&D funding

Investment Shift
From fossil fuels to green alternatives

Technological Progress
Advancement in clean energy technologies

 Source: "Why Nations Fail", Acemoglu, Robinson ; Desk Research

What are the Challenges?

Countries with weak institutions may face significant challenges in managing the energy transition, particularly in ensuring that the costs and benefits are distributed fairly.

Challenges for Countries with Weak Institutions

1

Fair Distribution

Ensuring equitable distribution of costs and benefits in the energy transition.

2

Juste Transition

Supporting coal-dependent regions in the shift to green industries.

3

Retraining Programmes

Providing workers with skills for the renewable energy sector.

4

Job Creation

Fostering employment opportunities in green industries.

 Source: "Why Nations Fail", Acemoglu, Robinson ; Desk Research

How to proceed?

The resistance from vested interests highlights the importance of having strong political institutions that can resist pressure while pushing forward with necessary reforms.

The Importance of Strong Political Institutions

1

Resistant Institutions

Able to withstand pressure from vested interests.

2

Political Consensus

Building broad support for energy transition policies.

3

Effective Implementation

Ensuring policies are put into practice.

4

Stakeholder Mediation

Balancing interests for sustainable progress.

 Source: "Why Nations Fail", Acemoglu, Robinson ; Desk Research

The need of strong institutions for a successful energy transition in Europe

What will be the future foundation?

Governance and policy stability are crucial in ensuring that long-term commitments are credible. This fosters investment in renewables by reducing uncertainty.

1 Inclusive Institutions

Encourage participation and innovation in renewable energy markets

2 Transparent Regulation

Foster competition and allow new players to enter the market

3 Policy Stability

Ensure credibility of long-term commitments like the EU's Green Deal

4 Long-term Commitments

Reduce uncertainty for businesses and investors in renewables

 Source: "Why Nations Fail", Acemoglu, Robinson ; Desk Research

05

Conclusions

Conclusion

Critical Success Factors for the Energy Transition!

Europe can navigate the complex challenges of energy transition and move towards a sustainable, equitable future.

1. **Inclusive Institutions**
   Fostering participation and innovation in the energy sector.

2. **Directed Innovation**
   Supporting technological progress in clean energy.

3. **Shared Benefits**
   Ensuring wide distribution of gains from the transition.

4. **Political Will**
   Overcoming resistance to implement necessary changes.

 Source: Desk Research

Thank you!

Manuel Costeira da Rocha
Director Technology Strategy

m.rocha@smartenergy.net
+351 968 578 862

SMARTENERGY Group AG
Sihleggstrasse 17
CH-8832 Wollerau
Switzerland

info@smartenergy.net